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Bulletin N

THE UNI-FORM SYSTEM

OF WALL, FLOOR AND ROOF CONSTRUCTION

IN REINFORCED CONCRETE

FLAT-SLAB CONSTRUCTION
RIB-SLAB CONSTRUCTION
RELIEVED-SLAB CONSTRUCTION
WALL CONSTRUCTION

(See Bulletin M for Beam-and-Joist Construction)

Owned and Operated by

THE UNI-FORM COMPANY

Engineer–Constructors

10 HIGH ST., BOSTON, MASS.

Patented February 20, 1917
Additional Patents Pending

Conservation Is Now a National Obligation

THEREFORE

Conserve your Labor
Conserve your Material
Conserve your Time
and thereby
Conserve our Material Resources
not forgetting that in so doing you
Conserve your Own Money

The statements in this Bulletin are so strong that they may seem to you questionable. Do not let this assumption mislead you. "Hot air" no longer has a place in Trade Literature. "Cold facts" are the only things that count. This Bulletin is written with the strictest regard for this principle notwithstanding the easy tone of its language.

The UNI-FORM SYSTEM appeals equally to the Owner, the Architect and the Contractor. In this Bulletin we make no attempt to discriminate. In the last analysis the interests of all three are identical.

FOREWORD

THE UNI-FORM COMPANY is organized to develop the general use of a system of Wall, Floor and Roof Construction in re-inforced concrete, designed by Nils F. Ambursen, Mem. Am. Soc. C. E., of the Ambursen Construction Company, New York and Boston. It is not a theoretical design laid out on the drafting table but is the outgrowth of twenty years experience of one of the most competent, practical and resourceful concrete engineers of the day.

Our work, originally designed for Beam-and-Joist construction, now covers the entire field of wall, floor and roof construction in reinforced concrete. Our primary object is not the saving of concrete. Of course, we save it, — 20 to 40 per cent of it, — by pans and domes just as many others do, and neither more nor less; — but we save it in such a simple and practical way that it is a real and net saving.

To save concrete is a good thing, but it is not the whole thing. It is not even a good thing if it costs $1.10 in lumber and labor to save $1.00 in concrete.

The reason for the existence of the UNI-FORM COMPANY is a keen recognition of that vast unworked no-man's-land remaining, namely, — the appalling waste in lumber and labor of the present methods. This field has not been touched: — we alone occupy it.

In your own interest we commend a careful reading of the following pages. But in doing so, we ask that you keep clearly in mind that the saving of lumber and labor is our primary objective, — the saving of concrete is great, but follows as a matter of course.

Very respectfully,

THE UNI-FORM COMPANY
William L Church, President

What We Do For You

Using tabloid assertions, what do we do that is worth while,—and do we do it?

We practically eliminate your huge lumber bill bodily,—also nails,—also wire;—that is, we cut out nearly all of your "consumable material" and by *complete salvage* convert what little is left into *"permanent plant."*

We cut down your labor account, not twenty-five or fifty per cent, but nearer seventy-five per cent.

We speed up the floor work four to one, man for man.

We save cement losses absolutely and leave a smooth finish,—no patching up.

We put an end, once and for all, to re-shoring.

We eliminate ninety per cent of the field-fitting even when the building is out of square.

We cut out three-quarters of your storage space and hauling charges.

We have standardized unit costs and made them reliable.

And with all the above

We still save twenty to forty per cent of the concrete. This means less dead load, and remember that

Dead-load never earned a Dollar

Cut it down and correspondingly lighten the weight and cost of your walls, columns, foundations and piling.

Do we accomplish all this? The following pages are rationally convincing and have long since been translated into results.

Uniforms Applied to Floor Construction

THE UNI-FORM COMPANY undertakes to cover the entire field of floor construction with a system of steel forms so designed that every type of floor can be built with substantially the same plant and by identically the same set of motions. The extra units are merely those which give the desired shape to the underside of the floor, while the supporting system and routine of handling are common to all types.

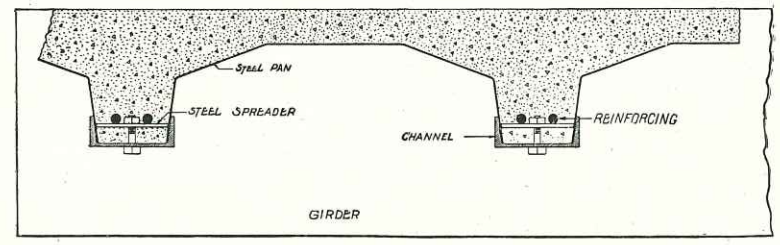

Figure 1
Beam-and-Joist Floor

BEAM-AND-JOIST CONSTRUCTION by the Uni-Pan System.

Since this system is particularly obvious and contains all the basic UNI-FORM principles, we have been at pains to explain it in detail in our Bulletin M, to which please refer. Fig. 1 shows this type of floor and its elementary construction. Because it is the type first described it must not be inferred that it is the most important.

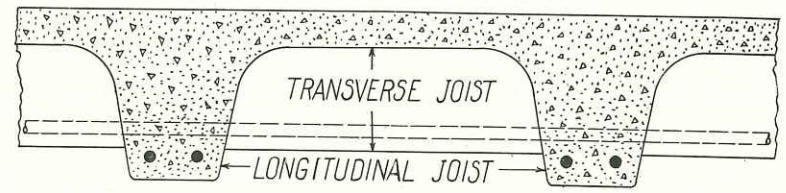

Figure 2
Relieved-Slab Floor

RELIEVED-SLAB CONSTRUCTION by the Uni-Dome System.

This system is more difficult to illustrate in a single cut, but Fig. 2 shows a section at right angles to the deep joist.

The cellular floor constructed by the use of domes has several marked advantages over every other type. We shall discuss these more fully on pages 8 to 10 of this Bulletin.

FLAT-SLAB CONSTRUCTION by the Uni-Panel System.

The flat-slab floor has reached a well deserved and wide acceptance due to several causes here enumerated.

A material saving in cost of forms as hitherto constructed, in comparison with the old beam-and-grinder or beam-and-joist systems. **But note that this**

difference of form-cost no longer exists, since the UNI-FORM SYSTEM builds ANY type of floor on identically the same field-cost per square foot for labor and form material. The engineer can therefore select his preferred type of floor without reference to the cost of forms.

A large saving in head room due to the elimination of deep girders.

A plane ceiling which is favorable to the distribution of automatic sprinklers and to the reflection of light in buildings of considerable width.

A material saving in the inherent cost of the floor itself. This arises principally from the small moment factors allowable, resulting in a variable saving in steel which, for purposes of illustration, might be called 25 per cent. On the other hand this is partially offset by a heavy increase in the amount of concrete. The combination of the three factors nevertheless results in a net saving of considerable proportions. This is most marked in connection with moderate spans and heavy loads, and diminishes with reduction of load and span up to a point where other types of floor become the most economical. This neutral point of cost is reached earlier by the use of UNI-FORMS on account of the unvarying cost of the form work, regardless of the system. Having in mind, therefore, UNI-FORM construction, the architect and engineer will find the beam-and-joist system capable of greater economical extension in respect to load and span than hitherto.

Recognizing the inherent qualities of the flat slab, it is only necessary to apply the UNI-FORM principle to its construction, and this we now describe.

It has been made clear in Bulletin M that one of the fundamentals of the UNI-FORM SYSTEM is a skeleton frame work of steel channels with provision for adjustment to any span and for the avoidance of reshoring. This principle with all the advantages that flow from it remains unchanged in flat-slab construction.

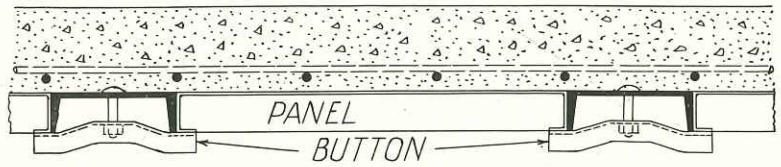

Figure 3
Uni-Forms for Flat-Slab Floor

Fig. 3 illustrates the UNI-FORM SYSTEM for flat slabs. The channels are turned over, flat side up. They are carried on posts and triple stringers precisely as described in Bulletin M, the only difference being that on account of the greater weight of floor to be supported, intermediate temporary struts may be required, — of which later.

The channels are the standard 6′, 8′ and 10′ lengths, A pressed steel button having a ∪-shaped section is held in place by a round headed bolt with nut, making use of the holes already in the channel. The buttons are tightened in position on the ground; — the channels are then lifted to the stringers and roughly gauged 19 inches apart as described in Bulletin M, each being lightly held by a single wire nail at each end.

Fig. 4 is a view of the working or top face of the Uni-Panel, and Fig. 5 a corresponding view of the underside. Fig. 6 is a cross-section showing its construction. The panel is made in a break-press from a single piece of 14 gauge steel. This is backed on the underside by a piece of light steel known as "truss-plate." The projections are 7/16″ deep and on 5″ diagonal centers. The face

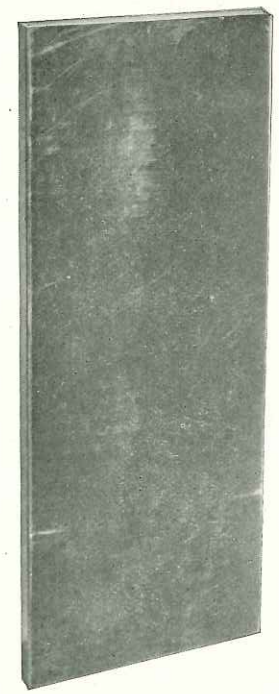

Figure 4
Faee of Uni-Panel

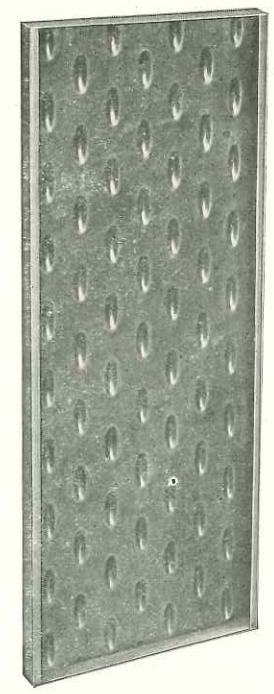

Figure 5
Back of Uni-Panel

plate and back plate are spot-welded in the crown of each "bump" making a composite plate 1/2″ thick. The truss action thus introduced in connection with the channels on the sides and ends makes a light and stiff panel incapable of distortion under any load. The total thickness of the panel corresponds exactly to the depth of the flange of the channel, and the precision of this thickness is assured by the method of manufacture.

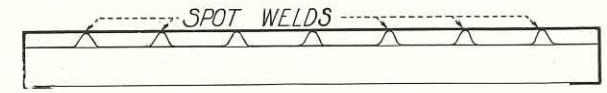

Figure 6
Section Showing Construction of Panel

The simplicity of erection is obvious. The channels having been set and roughly gauged, the panels are merely dropped into place from the top, their lower edges resting on the projecting ends of the buttons acting as stops, and are then pulled up snug to the channels. The face of the panels therefore necessarily falls into the same plane with the back of the channel, leaving a watertight and invisible joint. The reinforcement is then placed and inserts set exactly as with wooden forms, after which concrete is poured. The expansion gap is covered by a strip of 18 gauge steel, so thin as to make a tight joint and leave no mark.

The channels are supported at their ends on the queen stringers, and if the floor is heavy and the channels 8′ long or over, a 4″ x 4″ strut without cross head may be set up midway of their length.

In ordinary weather the concrete will set in from two to three days sufficiently to permit stripping. The temporary struts are removed, the buttons slacked and turned lengthwise of the channel. This releases the panels which are taken down leaving the floor supported on the main shoring and stringers with the covers temporarily held up in place. The temporary span of the floor is therefore from 6′ to 10′ according to the length of channels used, which is amply safe to carry the shoring for the second floor. After the concrete is fully hardened, the stringers and main shoring are removed and the covers released, all exactly as described in Bulletin M.

Two standard lengths of panels are used, 4′ and 6′, weighing respectively 30 and 45 lbs., which with the covers will meet any variation of span. The ease and rapidity with which these are assembled and stripped is apparent.

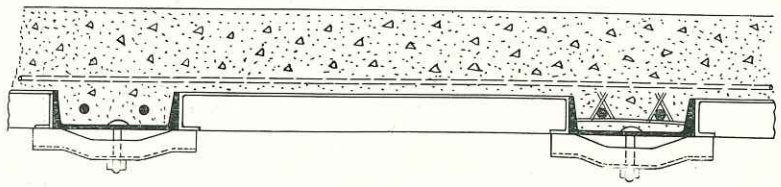

Figure 7
Uni-Forms for Rib-Slab Floor

RIB-SLAB CONSTRUCTION, also by the Uni-Panel System.

This is identical with the foregoing except that the channel is **turned over** with the hollow side up as shown in Fig. 7. The same button is used, except that it also is reversed. The button is of pressed steel, arched in shape so that when reversed the same bolt may be used either way. The erection is identical with the plain slab, the only difference being in the reversed position of the channel and button.

One might hastily assume that the rib is a mere freak or accidental construction arising from reversing the position of the channel but without any distinctive value. So far from that, this simple expedient has introduced a new economy into the building arts, the aggregate of which, reckoned in the combined money cost of concrete and steel will range from 3 to 4 cents per square foot over the plain flat-slab, and without any offsetting disadvantages. This economy, however, can be secured **only** by the UNI-FORM SYSTEM since the rib is formed without any increase of cost whatsoever. If an attempt were made to form the rib by any other method it can readily be seen that the cost of forming it would more than offset the economy secured.

We therefore invite careful attention to the following demonstration in which we have purposely avoided technicalities and formulas, and have attempted to treat it in language which will be understood by anyone having an elementary knowledge of the principles of floor design.

We will first consider the Rib-Slab in connection with oblong bays, — that is, in which the columns are spaced wider in one direction than the other. Take the case of a slab covering a bay say 20′ x 25′. If designed with reference to the 20′ span, its thickness will be 8″ for a 200 lb. live load; see Fig. 8. But if designed for the 25′ span, its thickness will be 10″; see Fig. 9. Now the latter thickness in the plain slab must necessarily govern.

Such a floor will be reinforced on the two-way system by two sets of rods at right angles to each other at the respective depths **a** and **b**.

Now note the Rib-Slab as designed in Fig. 10. Assume that the section

shown is on the shortest span so that the observer is looking in the direction of the 25′ span, the total thickness remaining at 10″ as in Fig. 9. Collect the reinforcement contained in a strip 25″ wide (the unit width of our forms) and concentrate it into two rods of an equivalent area of steel. Raise the transverse reinforcement to the depth **d** Fig. 8 or the plane which would have been occupied by the longitudinal reinforcement in an 8″ slab for the 20′ span. Finally cut out the useless concrete between the ribs shown by the shaded area.

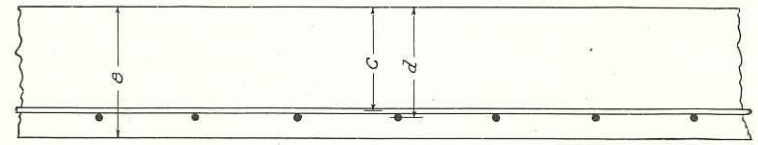

Figure 8
Eight-inch Flat-Slab for 20' Span

Now what has happened?

In the first place, 16 per cent of the concrete has been saved.

Second, longitudinal reinforcement has been reduced due to the above reduction of dead load.

The cost of steel, moreover, is further slightly reduced owing to the relatively lower price per ton of the larger rods.

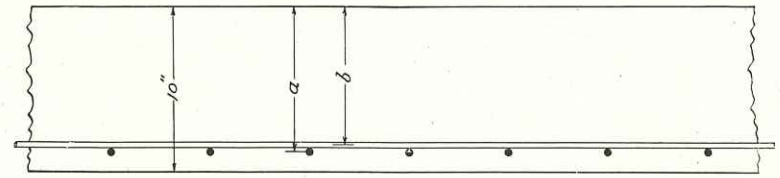

Figure 9
Ten-inch Flat-Slab for 25' Span

The labor of placing is reduced at least 80 per cent, of which 50 per cent is due to the fact that only two rods have to be handled instead of four, and the remainder to the almost automatic spacing and clamping by the spreader, which has been fully described in Bulletin M.

On the other hand the transverse reinforcement has been raised 1½″, which would increase its area were it not that this is offset by the 16 per cent reduction of dead load.

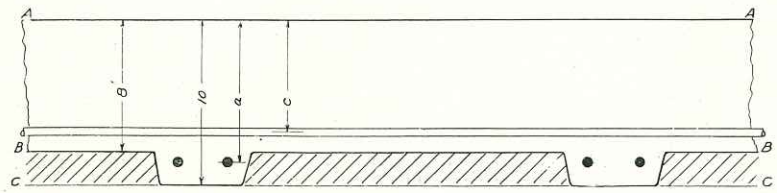

Figure 10
Rib-Slab Floor for 20'x25' Bay

The above analysis applies to the slab proper between the drop-panels. When the drop-panels including all the concrete over the supports are considered, the saving in concrete becomes 13 per cent of the total.

As to the steel, it must be remembered that about 50 per cent is found in the drop-panels to take care of the negative bending moment. The reduction of 16 per cent of dead weight in the slab proper reappears as a reduction in the amount of this negative reinforcement. Each case must be worked out by itself according to conditions, but, broadly speaking, the general result will be a saving of from 2 to 6 per cent in the total steel.

By this simple expedient, which is the natural outgrowth of the UNI-FORM SYSTEM, we are able to present a new type of flat-slab floor showing a reduction of composite cost of from 3 to 4 cents per sq. ft., depending upon the load and relative span of the bay.

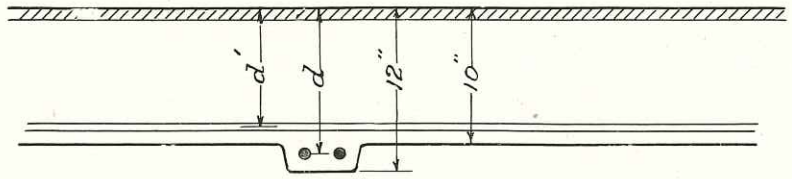

Figure 11
Demonstration for a Square Bay

In designing a square bay it is on the whole best of consider the rib as added to the normal thickness. Let Fig. 11 represent a section of floor for a square bay, and consider it from this view-point. The essential result remains the same.

Concentrate the longitudinal reinforcement as before and drop it say 1½″ into a rib which we will now assume to be added to the thickness of the slab. Then drop the transverse reinforcement ½″ into the plane formerly occupied by the longitudinal system. We may now elect either to take the reduction of steel due to the increased depth less the effect of the slightly increased weight, the thickness of slab remaining unchanged; — or we may take a certain determined thickness off the top of the floor, as shown by the shaded strip. If the latter we have reduced dead weight by the amount of the shaded strip less the weight of the rib, and can then proceed to a recalculation of the steel. The net saving in composite cost will be found to work out about the same.

Incidentally an advantage by no means to be lost sight of is the fact that a perfect bond is insured on both systems of rods. Instead of being in contact at their points of intersection so that the concrete can not fill around them, they are 1½″ apart, thus insuring an absolute bond throughout the entire length of both systems.

RELIEVED SLAB CONSTRUCTION on the Uni-Dome System.

On page 4 we enumerated the advantages which have established the flat-slab floor in the favor of engineers, and pointed out two great offsetting disadvantages, namely, the extreme weight of the floor and the large amount of useless concrete wasted. This has come to be accepted as a necessary evil, which custom has tolerated so long as the balance of advantage was in the right direction. If therefore we are able, while retaining all the advantages named, at the same time to get rid of all this useless dead weight and secure the economies thereby resulting, we have advanced to a still higher plane of efficiency in the building arts.

We re-print from Bulletin M certain illustrations which will make clear the method of construction. The resulting floor has already been shown in Fig. 2.

The plant and process are fundamentally the same as used throughout the whole UNI-FORM SYSTEM, the difference being in the use of domes in place

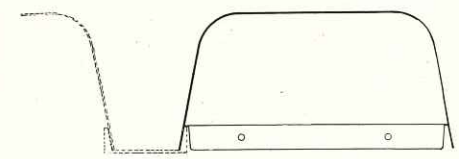

Figure 12
Section of Dome showing Form for Longitudinal Joist

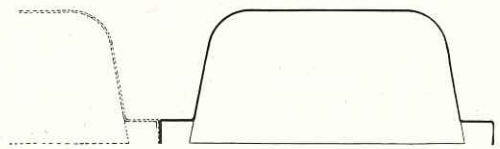

Figure 13
Section of Dome showing Form for Transverse Joist

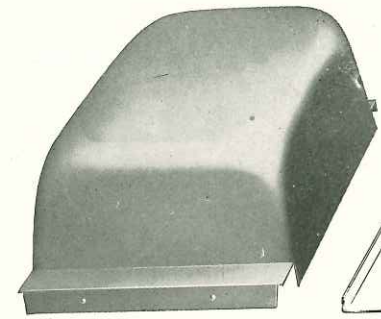

Figure 14.
The Dome

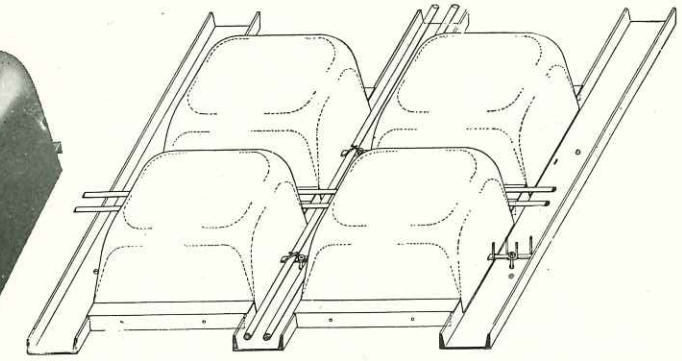

Figure 15
Assembly for Relieved-Slab Construction

of pans or panels. These are die-pressed from 16 gauge steel, 19″ square at the base, 4", 6", 8", 10" and 12" deep, and weighing from 12 to 20 lbs., according to depth. As in all other modifications of the UNI-FORM SYSTEM, the dome is strictly **permanent plant.** Its number of possible re-uses will run far into the hundreds. The dome is the only additional plant required. Channels and stretchers are the other parts and are common to the general system. No covers or headers are used.

It will be noted from Fig. 2 that the Relieved-Slab shows longitudinal joists 2″ deeper than the transverse joists. This permits of the crossing of the reinforcement with a clear space of 1½″ between the rods, thus insuring a perfect bond. Since this type of floor is always designed with reference to deflection, it will often enable the steel to be somewhat reduced in the longitudinal joists when the bay between the columns is nearly square. Often, however, the columns are spaced wider in one direction than in the other. As in the Rib-Slab, the deep joists will always run the long way of the span, thus giving a well balanced design. The reinforcement is of course on the well known two-way system.

The actual saving in concrete and dead weight in the slab between the drop-panels is as follows: —

4″ dome with 2″ floor	48 per cent
4″ dome with 3″ floor	43 per cent
6″ dome with 2″ floor	46 per cent
6″ dome with 3″ floor	42 per cent
8″ dome with 2″ floor	47 per cent
8″ dome with 3″ floor	43 per cent
10″ dome with 2″ floor	46 per cent
10″ dome with 3″ floor	43 per cent
12″ dome with 2″ floor	45 per cent
12″ dome with 3″ floor	42 per cent

This great saving in dead weight and cost of concrete reasserts itself in a similar saving in the reinforcement, both for the positive and negative moments. We are preparing a carefully worked out table expressed in terms of the net saving in concrete and steel under varying ratios of span in the bay, and each of these under a wide range of live load. This is a laborious work, and such tables do not properly belong in these pages. When they are completed and checked, it is our intention to publish them in permanent form for the convenience of engineers. For the general reader, however, it will not be misleading to say that as an illustration, the **net money saving,** in material alone (not including the saving in form work) based on 5 cents per lb. for steel and 30 cents per cu. ft. for concrete, — and taking into account the drop-panels as well as the actual slab, on a square bay 20′ x 20′, — will be as follows: —

Under 200 lbs. live load, net saving in cost of total material is 14%
Under 250 lbs. live load, net saving in cost of total material is 15%
Under 300 lbs. live load, net saving in cost of total material is 16%
Under 400 lbs. live load, net saving in cost of total material is 14%

NEXT — THE SUCCESSIVE STEPS IN FLAT-SLAB CONSTRUCTION

The simplicity of UNI-FORM construction as applied to flat-slabs is even more marked than in the beam-and-joist construction described in Bulletin M, since two operations, namely, the clamping of the spreaders and the dropping of the stretchers are omitted. For the convenience of the reader we will run a few cuts as a sort of "moving picture" and let them tell the story.

Figure 16

Set up the Posts on 6′ to 10′ centers as required, with double wedges under the foot. (Note that the posts are all ready to set up being salvaged intact from the last job.)

Place the Stringers setting them on double wedges bearing on the crosspiece of the post, **but do not nail them down or cut them off, let them lap by at the ends.** Here we save lumber, nails and wages, and the stringers are full salvage all the time. The 2″ x 6″ are called "queen stringers" — the 4″ x 6″ a "king stringer."

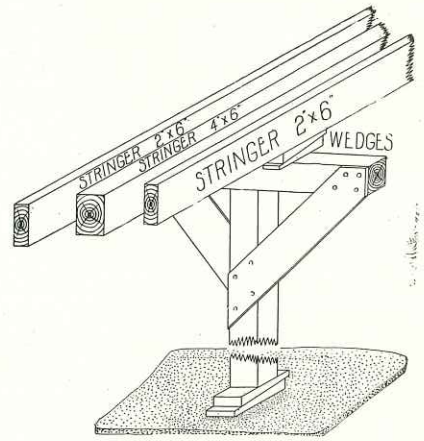

Figure 17

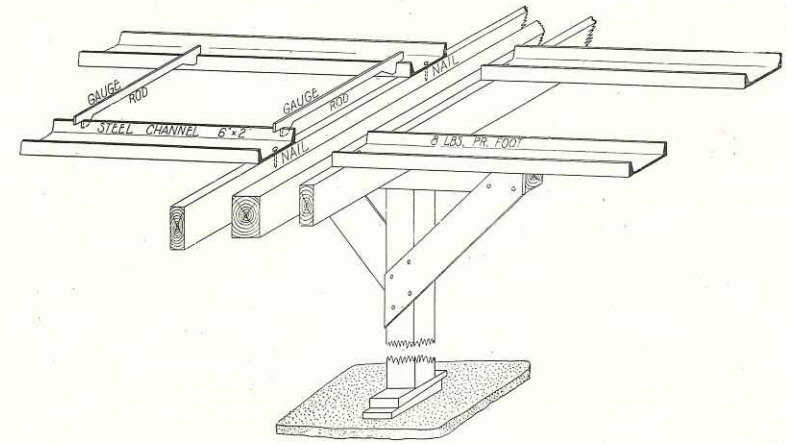

Figure 18

Place the Channels spacing them by the gauge rods 19″ long and drive one 10-penny wire nail at each end when the channel is flat side up for making the plain slab, or one 3-penny wire slate nail when it is hollow side up, for making the Rib-Slab. A two-man job, as they weigh only 48, 64 and 80 lbs. according to length.

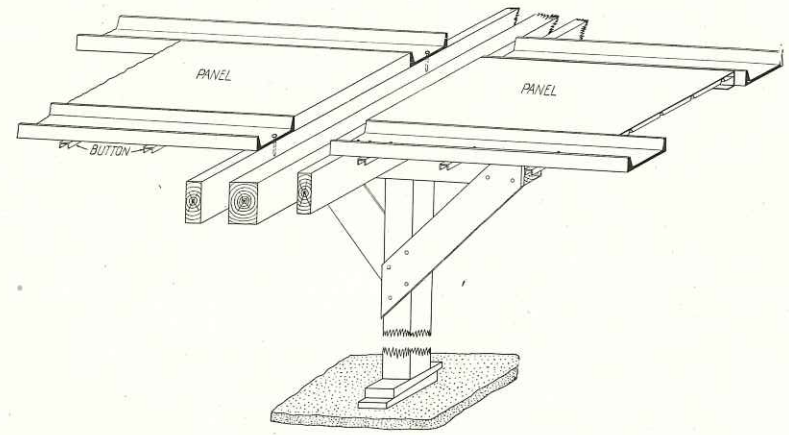

Figure 19

Set the Panels. Merely drop them down between the channels so that they rest on the stops or buttons; — **all work done from the top,** none underneath. No accuracy is required in the end spacing of either panels or channels, — the covers take care of that. Draw the channels and panels up tight as you go along. The panels are 4′ and 6′ long and weigh 30 and 45 lbs. respectively. They are best handled as a two-man job.

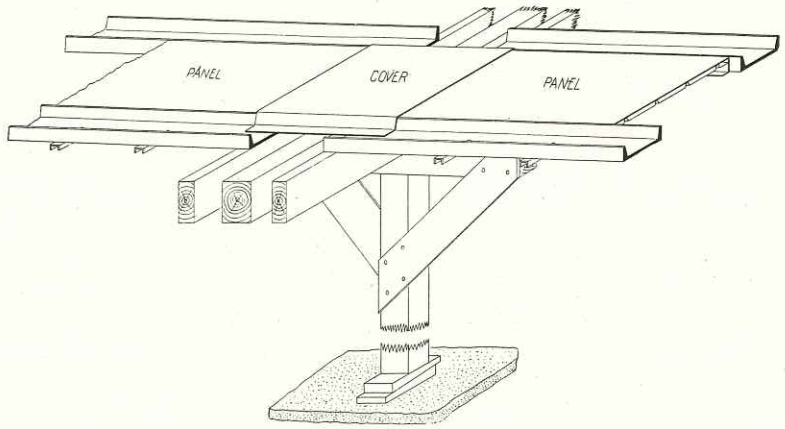

Figure 20

Place the Covers. A one-man job as they weigh only 8 lbs. each.

The UNI-FORMS are now complete, ready for placing reinforcement, setting inserts and pouring concrete.

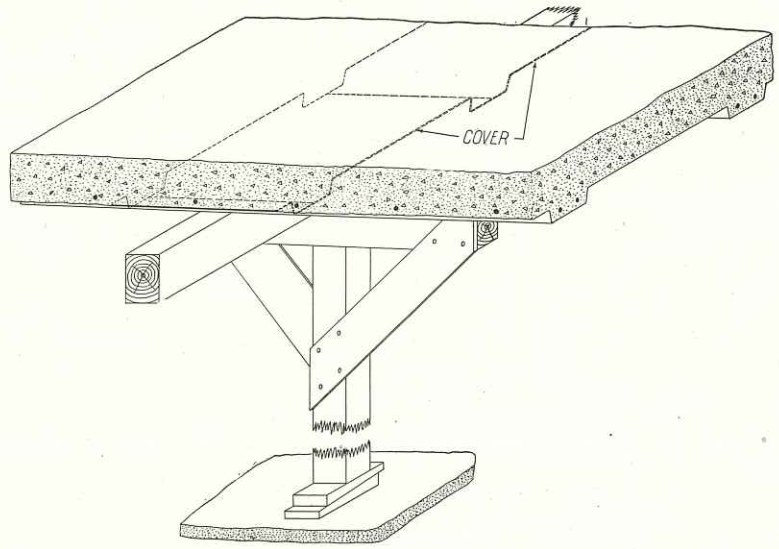

Figure 21

Stripping. On the second or third day remove the intermediate struts, if any, slack the wedges and take down the outside or queen stringers. The whole weight of the floor is now carried on the middle or king stringer, and neither that nor the posts under it are disturbed until the concrete is fully hardened. **No re-shoring,** you observe.

The channels, pans and queen stringers, — the major part of the plant, — are therefore released every two days, and you can go ahead with your second shift, using another set of posts, king stringers and covers only.

The shoring for the second floor can be safely set up meanwhile over the short temporary spans. When the concrete is safe, slack the wedges under the posts and take them away intact together with the king stringer. This releases the remainder of the outfit ready for another shift. **Complete salvage,** you will note.

THE JOB IS DONE.

FORM ASSEMBLY FOR FLAT-SLAB OR RIB-SLAB

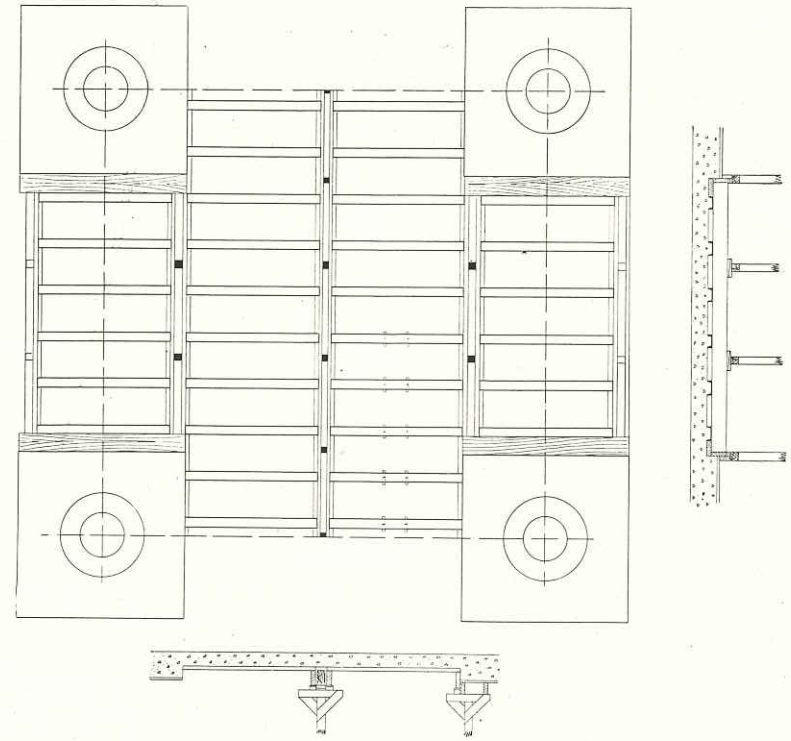

Figure 22
Assembly for Bay 20' x 20'

The absolute simplicity of the assembly is illustrated by Fig. 22 which is adapted to a standard bay formed by columns on 20 ft. centers both ways.

Nine posts are required to the bay, supporting three lines of triple stringers. Six ft. channels and panels will be used throughout. The 8″ expansion gaps over the stringers will be closed by covers. The drop-panels are 7′ 6″ square leaving 12′ 6″ in the clear. This space is exactly served by two 6′ channels and cover. In the other direction, spacing each way from the center, there is a strip 12½″ wide closed by a filler of plank, of which the ends rest on the stringers, one side being supported on the drop-panel form and the other carried by the buttons on the adjacent channel. All this will be clear from the sections shown.

The short channels are sufficiently stiff to carry any ordinary weight of floor without intermediate supports. The panels are merely dropped into place from above with their ends resting on the stringers and supported at the sides by the buttons on the adjacent channels.

UNI-FORMS APPLIED TO WALL CONSTRUCTION

The original intention of the UNI-FORM COMPANY was to confine itself to floor construction only. As the System developed in its various modifications it became evident that its application to walls was equally legitimate, — in fact with even greater variety and flexibility.

The full discussion of floors which has preceeded will at once suggest its application to wall construction. Identically the same plant is used as for floors. The same simplicity of labor reappears. In short, the wall and floor forms are interchangeable.

We feel like remarking at this point that we were fortunate in having first studied the floor problem. Having perfected floor construction, the transition to walls is merely passing from the simple to the still simpler. A study of the art shows that designers hitherto have attacked the wall problem first as being the easiest. In passing to the more severe problem of the floor it has been necessary to force the application with results which hitherto have been crude and unsatisfactory. No such criticism applies to the reverse proposition.

The subjoined sections of typical walls practically explain themselves.

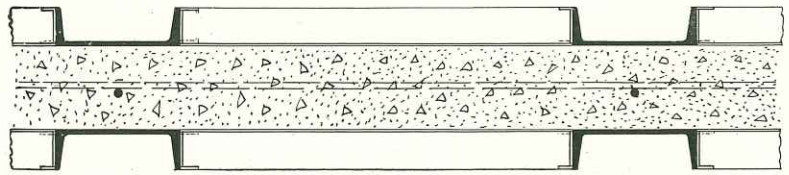

Figure 23
Uni-Forms for Plain Wall

Fig. 23 is the form assembly for a plain wall. The panel is held in place against the pressure of the concrete by the button as in Fig. 25 and kept from falling inward by a clip applied to the flange of the panel, and bearing against the channel as shown in Fig. 24.

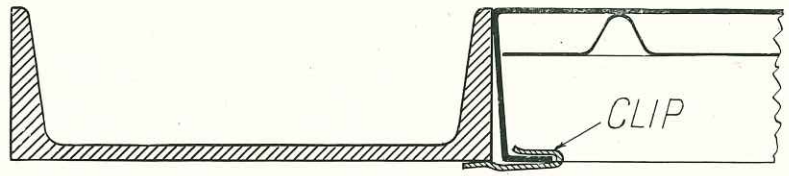

Figure 24

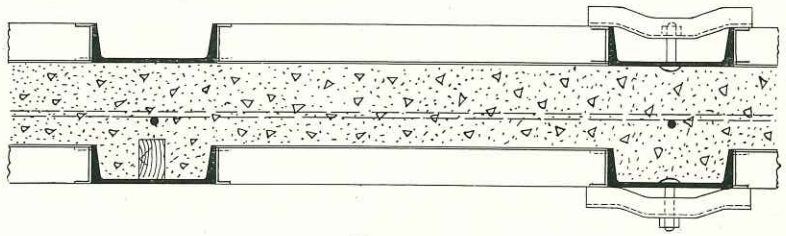

Figure 25
Uni-Forms for Single-Rib Wall

Fig. 25 is the assembly for a single-rib wall. A nailing strip may be embedded in the concrete for lath and plastering. The rib is formed by merely reversing one of the channels.

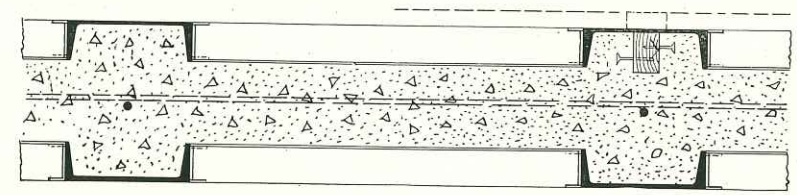

Figure 26
Uni-Forms for Double-Rib Wall

Fig. 26 shows both channels reversed, which is the form assembly for a double-rib wall. Nailing blocks may be inserted at intervals, and after the channel is removed a furring strip may be nailed thereto to carry a lath and plaster finish, as indicated by the dotted line.

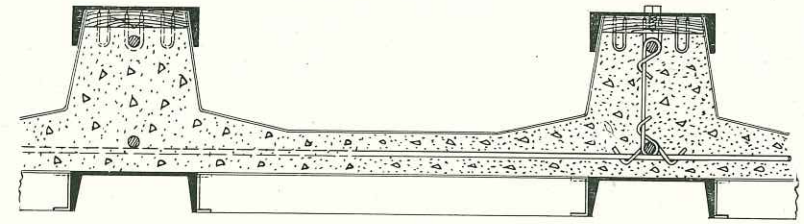

Figure 27
Uni-Forms for Single-Buttress Wall

Fig. 27 is the form assembly for a single-buttress wall. In this a pan is used for one side and a panel for the opposite side. Nailing strips can be attached to the concrete by staples when the wall is subsequently to be plastered.

The method of placing reinforcement is clearly shown, — remembering that the buttress side of the forms is erected first and the reinforcement then placed while everything is open to convenient handling. The form is then closed by placing the flat panels.

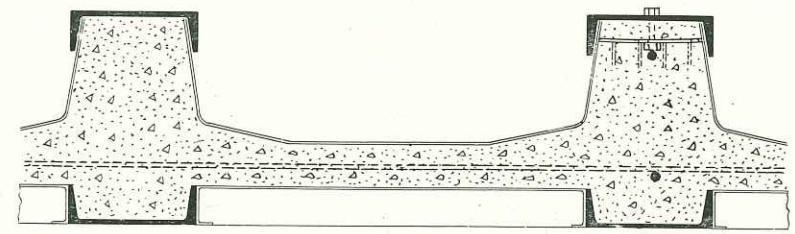

Figure 28
Uni-Forms for Buttress-and-Rib Wall

Fig. 28 is the obvious assembly for a buttress-and-rib wall, and varies from the preceding only by the reversal of the channel.

Fig. 29 is the assembly for the double-buttress wall in which two pans are placed back to back. The thickness is governed by the sleeve on the thro-bolt, so that a wall of any carrying capacity can be constructed.

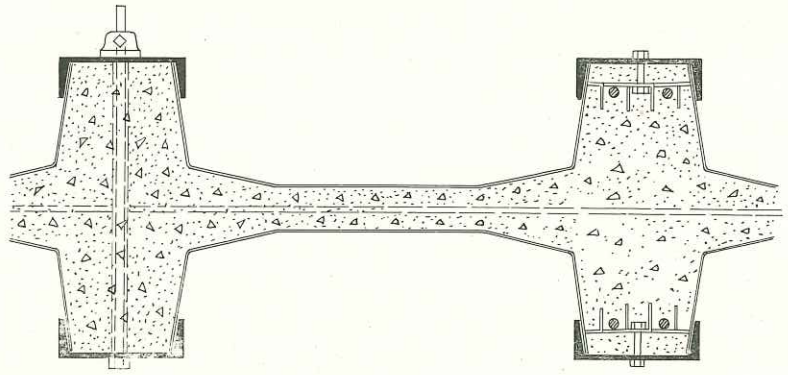

Figure 29
Uni-Forms for Double-Buttress Walls

Method of Erection. Figures 30 and 31 may be considered as applying to a single-rib wall intended for a single air space and plaster finish on the inside. The method of erection, however, is identical for either type of wall.

The walls may be built either by "climbing" in a series of lifts, using only one row of forms at a time, — or one entire story may be set up including both the walls and the floor, and the whole poured at once. In large buildings to support heavy loads and where construction is to be hastened, the latter method is preferable. In lighter construction such as cottage work etc., the climbing method will be found much more economical in the disposition and handling of the crew.

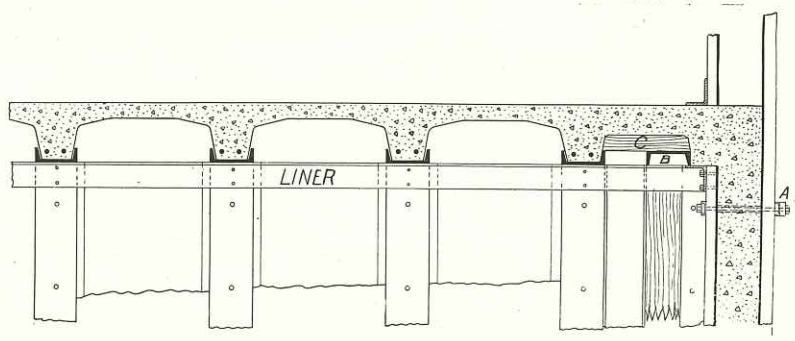

Figure 30
Wall Forms at Second Floor

Fig. 31 is a fragment showing the set-up at the base of the wall, and Fig. 30 that at the top. In either case the channels are set upright and bolted to a liner of angle iron at the top and bottom, using the same holes that are used as nail holes when setting up for floors. The liners hold the top and bottom of the channels in true alignment, and the thickness of the walls is determined by a pipe sleeve surrounding the thro-bolts. When the wall is to be "climbed" a thro-bolt and sleeve are inserted near the top of the channel at A, Fig. 30, and a similar one just above the first panel at B, Fig. 31. No spacer is required at

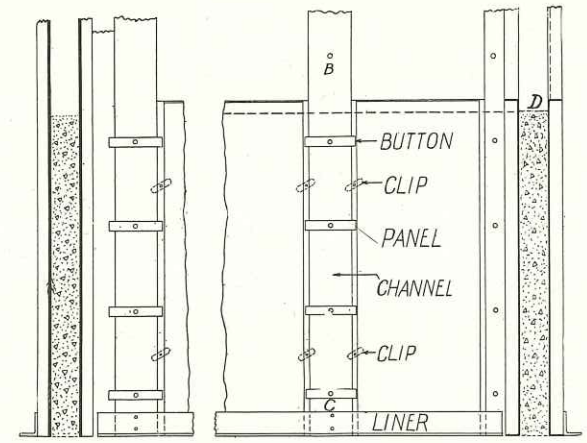

Figure 31
Wall Forms at Base of Wall

the bottom as the channel is stiff enough to carry the head of concrete for the first filling.

As soon as a row of panels is set up around the entire building, they are filled within 2″ of the top as shown by the dotted line, at D, Fig. 31. After two days when the concrete is set, the bolt at B is drawn and moved four holes higher up. The buttons and panels are then removed and slid up one lift higher, leaving the lower edge of the panel bearing against the concrete already placed. The second lift is then filled, — and so on, until the wall is up.

It will be noted that there are no bolts, sleeves or wire left in the concrete. Wire is no part of the UNI-FORM SYSTEM anywhere, and the bolts and sleeves are shifted ahead of the filling.

When the wall is up one story, other channels can be laid down using the top liners as a girt, and any type of floor, — the beam-and-joist in the illustration, — can be built by the use of the same plant.

In case there is an odd space left next to the wall which is not wide enough to take another pan, simply turn over a channel, place it next to the wall as at B, Fig. 30, and cover with a plank filler C.

In case the entire story is to be poured in one operation it will merely be necessary to use more thro-bolts to tie the channels together, surrounding them by a piece of speaking tube as a spacer. The bolts can then be drawn leaving the spacer in the work, and the hole subsequently plugged, — all of which is a very familiar operation.

It will seldom happen that the length of a wall is an exact multiple of 25″, which is our standard distance from center to center. Fig. 32 illustrates how we take care of this minor problem.

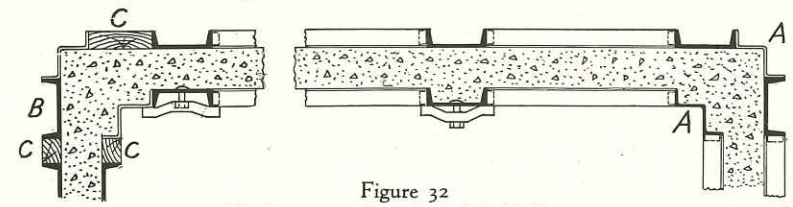

Figure 32
Uni-Forms in Corners and Odd Spaces

Corner plates A are a part of the plant and the same plate may be used either for inside or outside corners.

Set up forms beginning at one corner as at A and work both ways. On reaching the next corner fill the odd space by one or more reversed channels B, and close whatever space is still left with a plank filler C.

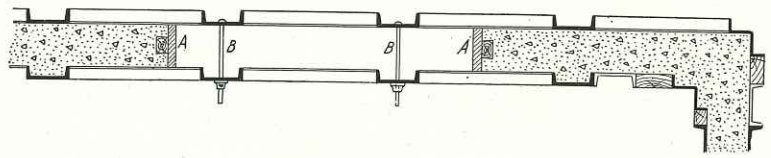

Figure 33
Window and Door Openings

Window openings and the like are taken care of just as easily, see Fig. 33. When one side of the forms is erected, set up the bull-frame, AA, to which a nailing strip has been lightly tacked. Get this plumb, square and level and then set up the face forms and tighten the whole thing in place by the thro-bolts, BB. The concrete will then fill against the bull-frame as a bulk-head, and when the forms are stripped the bull-frame can be taken out leaving an opening ready to receive the permanent window frame. To save knocking down the bull-frame each time, the nailing strips can be attached either by a couple of screws on each side or, still more simply, by double head pull-nails.

Any one of half a dozen ways can be used to meet this and similar points, but the above seems to embody the greatest practical simplicity.

SUMMARY

It only remains to assemble in one view the variety of wall and floor construction which the UNI-FORM SYSTEM places at the disposal of architects. This is best done by cuts of typical sections which, with the foregoing, tell their own story.

Six types of wall are available.

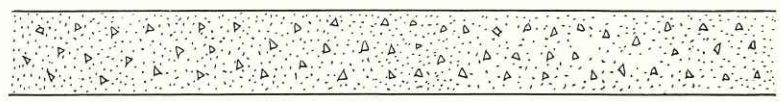

Figure 34

Plain Wall, Fig. 34. Of any desired thickness.

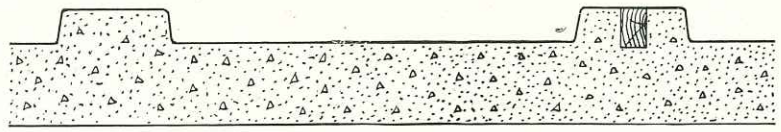

Figure 35

Single-Rib Wall, Fig. 35. For one air space and plastering on the inside. Adapted to industrial housing where outside finish is not important.

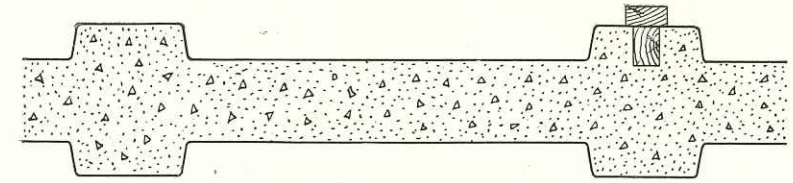

Figure 36

Double-Rib Wall, Fig. 36. Adapted to first class domestic architecture with two air spaces. Interior is plastered and exterior finished in plaster and dash.

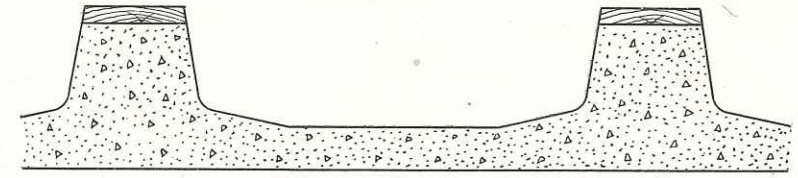

Figure 37

Single-Buttress Wall, Fig. 37. Suitable for retaining walls, coal pockets, factory buildings, etc. May be plastered over the air space if desired.

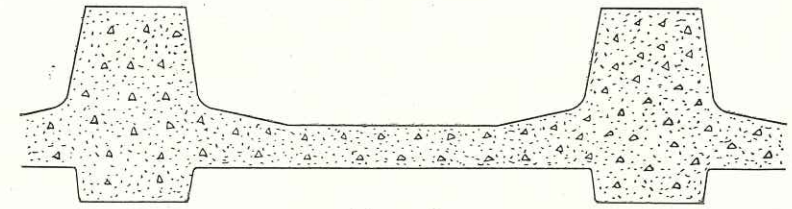

Figure 38

Buttress-and-Rib Wall, Fig. 38. This is merely a special combination of the foregoing adapted to certain rather rare conditions.

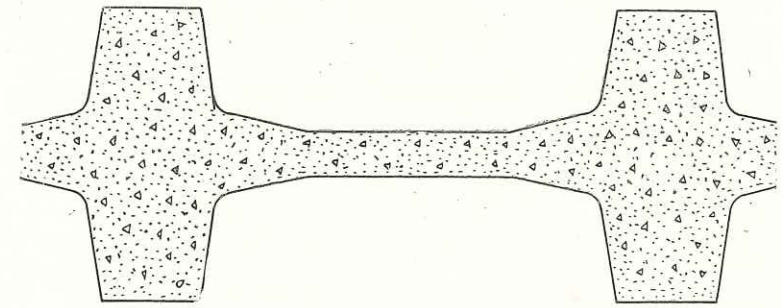

Figure 39

Double-Buttress Wall, Fig. 39. Suitable for retaining walls and heavy construction generally.

With either of these walls we may combine either of the floors next shown.

Four Types of Floor are Available.

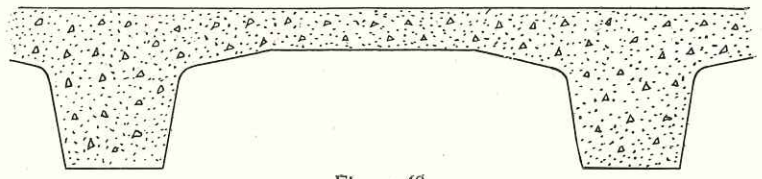

Figure 40

Beam-and-Joist Floor, Fig. 40. Suitable for moderately light loads and long or short spans. Joists may be left exposed, or plastered on wire lath if a smooth ceiling is required. This is the lightest type of floor for a given strength.

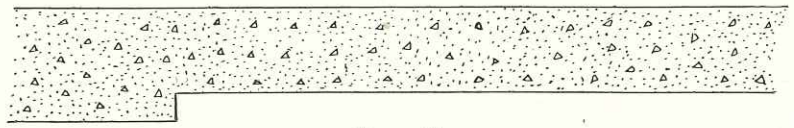

Figure 41

Flat-Slab Floor, Fig. 41. Suitable for heavy loads and moderate spans. The floor itself is the ordinary standard design without modification, and the UNI-FORM SYSTEM merely serves greatly to reduce the cost and increase the rapidity of its construction.

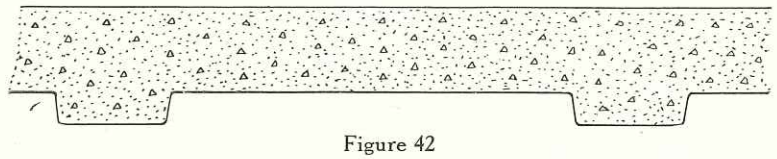

Figure 42

Rib-Slab Floor, Fig. 42. Suitable for the same load and span as the Flat-Slab floor and having the same characteristics, but with a saving in dead weight and cost of material.

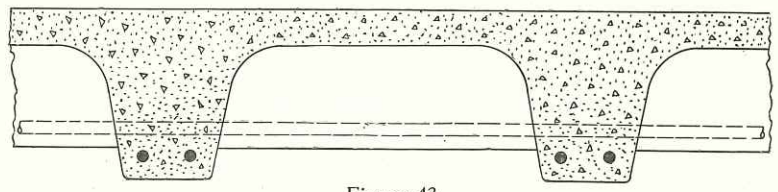

Figure 43

Relieved-Slab Floor, Fig. 43. This is the summit of the art of floor building in concrete. On account of the great saving in dead load, it is, for a given depth, adapted to longer spans and heavier live loads than any other type. Conversely it may have a greater depth for a given weight and span, and so support a heavier live load. Its cost of form erection is, if anything, a shade under that of either of the above types.

And the form cost of this and all other UNI-FORM construction, either in walls or floors, is but a fraction of the cost of form work by any other method.

What The Name Stands For

"UNI-FORM" is not a catch-word. It expresses an idea. The necessity has always existed;—the idea followed;—and the design solves the idea.

Every constructor dreads to estimate form work. Two contractors may be 100 per cent apart on the same job. Even the same contractor finding he has under-estimated forms on one job doubles his estimates on the next one.

The great war has done us a notable service in clinching in our minds the idea of *standardization.* UNI-FORMS are one expression of this idea applied to the most baffling detail of construction work.

All forms are reduced to a standard material, die-pressed in standard dimensions, and assembled in a standard way by a standard crew. Here is absolute uniformity of method, and what results? Why, uniformity of cost necessarily,—the short word for which is "economy."

Standardization,—which is the other name for UNI-FORMS,—appeals to the Owner because it reduces costs to the lowest terms.

Standardization,—which is the other name for UNI-FORMS,—appeals to the Architect because it reduces floor design to a uniform routine, and fixes the emplacement of the steel.

Standardization,—which is the other name for UNI-FORMS,—appeals to the Contractor because he can organize a standard crew who will go through a standard set of motions.

Anything less than standardization is dearly bought at any price.

AND FINALLY

Turn back and read page two and then write us.